Vegetation Monitoring Davidson Mesa – South Louisville, Colorado

2018 Report

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Vegetation Monitoring of Davidson Mesa - South
Louisville, Colorado

INTRODUCTION

Quantitative vegetation sample plots have been established as part of the monitoring program to help guide management decisions at the Davidson Mesa – South property. It is anticipated that fire will be used as a management tool for the existing vegetation and before- and after-fire data will aid in the evaluation and monitoring of management efforts.

An initial site visit determined that the vegetation had distinct units that would be best to sample separately. The area was mapped to define the location and extent of these units and samples were subjectively assigned to the different units. The intent was to properly represent the quantitative vegetation cover as well as the inherent diversity among and within the mapped vegetation units. Six vegetation units were mapped and the unvegetated trail was also mapped.

Note: the property boundaries were not fully surveyed so some adjustment of the boundaries was made to more closely line up with the aerial orthophotography. The acreages are estimates and not exact.

The twenty samples at the Davidson Mesa - South site are shown in Figure 1. The transect origin (start) is represented by a star and the approximate transect location and orientation are attached to the star. The sample ID includes the sample number and an abbreviation of the vegetation unit. The vegetation units are described in the Results section of this report.

These data were collected as a component of a comparison study of changes over time following a fire management treatment. A second post-fire sampling is anticipated for 2019.

METHODS

Vegetation mapping was conducted using a WAAS enabled GPS unit and ESRI Collector with horizontal accuracy of about 1 to 2 meters. Vegetation boundaries were determined on the ground and recorded by walking the boundaries while recording with the GPS unit.

Vegetation cover and species density data were collected at each transect location. Two photographs were taken at each sample, with one photograph taken at the origin as well as the end of each transect, and oriented along the transect. Sampling for all samples occurred October 17-19, 2018.

The starting point of each transect was recorded with a GPS unit, and the slope and aspect of the start point and the transect orientation relative to the start point were also recorded. Aluminum survey markers on a 1 foot piece of rebar were installed at each start point to enable future sampling at that same location. The survey markers were driven into the soil with only the top 1 inch visible at the surface. The survey markers were stamped with the word “Ecotone” and the sample number.

Foliar cover data were collected as point-intercept data, using the Cover-Point optical scope along a 50 meter transect. Point data were collected at each meter, with one point at 0.5m from the center line on both sides of the transect for a total of 100 points (2 points at each meter x 50 meters). Data were recorded as first-hit and second-hit data for vegetation and standing dead plant material; and ground cover hits were recorded separately for bare soil, rock and litter.

Rock was considered to be any inorganic material greater than 1 cm. in diameter. Standing dead was considered to be any organic material that was still standing and was produced in the previous growing seasons. When possible the standing dead material was recorded to species.

Species density data were collected in a 2 meter x 50 meter plot that was centered on the 50 meter transect. Any species that occurred within the plot was recorded. The final density value is presented as the number of species per 100 sq.m.

Plant species nomenclature follows Weber & Wittmann 1992 (with 1999 addenda).

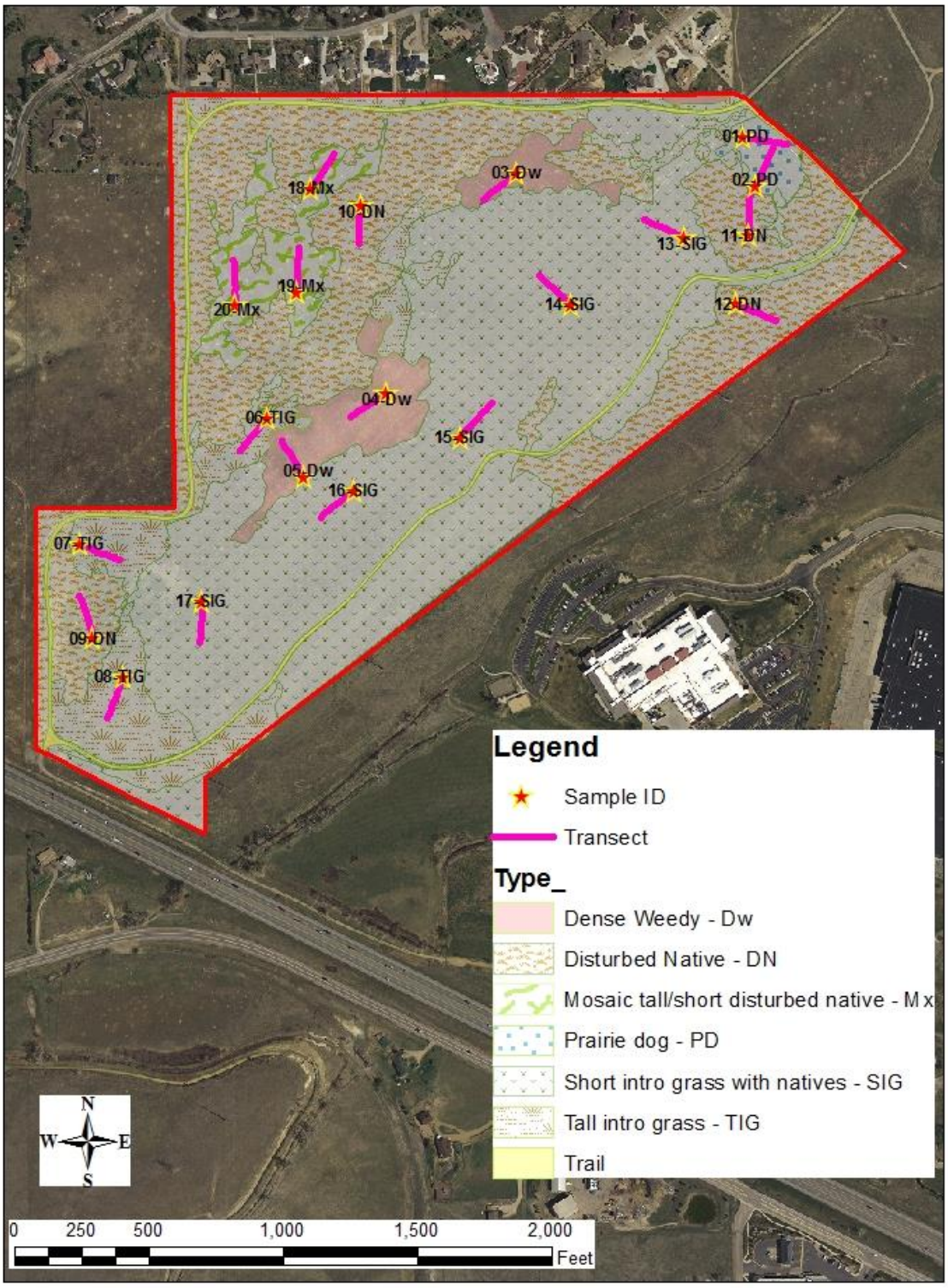


Figure 1. Project Location – Davidson Mesa - South - 2018.

RESULTS

The combined sample data with summary information are presented in Table 1 (12 pages). This table also provides the complete list of species from all 20 samples. The Vegetation Type-specific data are presented separately with more complete descriptions in the Discussion section.

Figure 2 provides the total vegetation cover results summarized in a bar graph. Figure 3 provides the relative cover by lifeform for all of the transects. Figure 4 provides the species density by lifeform for all of the transects.

Six distinct vegetation types were mapped and sampled. They were:

Dense weedy – Dw = 6.07 acres
Disturbed Native – DN = 35.06 acres
Mosaic tall/short grass with natives – Mx = 4.97 acres
Prairie dog – PD = 1.37 acres
Short Introduced Grass with natives – SIG = 47.13 acres
Tall Introduced grass – TIG = 11.34 acres
Trail - unvegetated = 2.73 acres
Total acres = 108.69

The climate as well as site specific disturbance events were likely contributors to current vegetation cover and composition. Figure 5 provides an estimate of the climatic changes over time using Thornthwaite climate diagrams that present the average monthly temperatures (blue line), precipitation (blue dashed fill), and potential evapotranspiration (red fill). These climate data were collected at Boulder, but probably provide a reasonable estimate of conditions at the Louisville sample sites although site specific weather events can be highly variable. The long term diagram shows that there are typically wet springs followed by drier summers where evapotranspiration exceeds precipitation from about mid-May to October.

The duration of soil saturation and the frequency and intensity of precipitation events can play a significant part in species composition.

The truncated end of the 2018 Thornthwaite climate diagram reflects the data that are not yet reported for November and December of this year.

Sample site specifications and notes are presented in Table 2. Photographs are presented in Appendix A.

Table 1. All Cover Data 2018 (20 Samples)

PLANT SPECIES

Scientific Name	Synonym	Common Name	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)
NATIVE ANNUAL & BIENNIAL FORBS							
Cirsium undulatum		WAVYLEAF THISTLE	0	5	0	0	0
Dyssodia papposa		FETID MARIGOLD	0	10	0	0	0
Erigeron divergens		SPREADING FLEABANE	0	20	0	0	0
Grindelia squarrosa		GUMWEED	0	25	0	0	0
Helianthus annuus		COMMON SUNFLOWER	0	10	0	0	0
Plantago patagonica		WOOLLY PLANTAIN	0	10	0	0	0
TOTAL NATIVE ANN. & BIEN. FORBS			**0**	**35**	**0**	**0**	**0**
INTRODUCED ANNUAL & BIENNIAL FORBS							
Acosta diffusa	CENTAUREA DIFFUSA	TUMBLE KNAPWEED	0	10	0	0	0
Alyssum parviflorum		ALYSSUM	0	10	0	0	0
Bassia sieversiana	KOCHIA SCOPARIA,K. SIEVERSIANA	BURNING-BUSH	0	25	0	0	0
Carduus nutans ssp. macrolepis		MUSK THISTLE	0	30	0	0	0
Conyza canadensis		HORSEWEED	0	40	0	0	0
Descurainia sophia		FLIXWEED TANSYMUSTARD	0	25	0	0	0
Erodium cicutarium		FILAREE	0	5	0	0	0
Lactuca serriola		PRICKLY LETTUCE	2	65	5	2	5
Lappula redowskii		EARLY STICKSEED	0	10	0	0	0
Melilotus officinale	MELILOTUS OFFICINALIS	YELLOW SWEETCLOVER	2	45	3	2	4
Podospermum laciniatum	SCORZONERA LACINIATIUM	FALSE SALSIFY	0	5	0	0	0
Salsola australis	SALSOLA IBERICA,KOCHIA IBERICA,S. KALI,S. PESTIFER	RUSSIAN THISTLE	3	65	7	3	7
Sisymbrium altissimum		JIM HILL MUSTARD	0	30	0	0	0
Solanum americanum	SOLANUM NIGRUM	BLACK NIGHTSHADE	0	5	0	0	0
Solanum triflorum		NIGHTSHADE	0	5	0	0	0
Tragopogon dubius ssp. major		YELLOW SALSIFY	0	40	0	0	0
Verbascum blattaria		MOTH MULLEIN	0	10	0	0	0
Verbascum thapsus		MULLEIN	0	85	1	0	1
Ximenesia encelioides	VERBESINA ENCELIOIDES	COWPEN DAISY	0	10	0	0	0
TOTAL INTRO. ANN. & BIEN. FORBS			**8**	**100**	**18**	**9**	**18**
INTRODUCED ANNUAL GRASSES							
Anisantha tectorum	BROMUS TECTORUM	CHEATGRASS	5	65	11	5	11
Bromus japonicus		JAPANESE BROME	1	30	1	1	1
TOTAL INTRO. ANN. GRASSES			**6**	**80**	**12**	**6**	**12**

Table 1. All Cover Data 2018 (20 Samples)

PLANT SPECIES

Scientific Name	Synonym	Common Name	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)
NATIVE PERENNIAL FORBS							
Adenolinum lewisii	LINUM LEWISII	BLUE FLAX	0	10	0	0	0
Ambrosia psilostachya var. coronopifolia		WESTERN RAGWEED	0	10	0	0	0
Artemisia frigida		FRINGED SAGE	1	80	2	1	3
Artemisia ludoviciana		PASTURE SAGE	0	25	0	0	0
Asclepias speciosa		SHOWY MILKWEED	0	5	0	0	0
Castilleja sessiliflora	CASTILLEJA GRANDIFLORA	LARGEFLOWERED PAINTBRUSH	0	5	0	0	0
Comandra umbellata ssp. pallida		BASTARD TOADFLAX	0	15	0	0	0
Drymocallis fissa	POTENTILLA FISSA	BIGFLOWER CINQUEFOIL	0	5	0	0	0
Eriogonum umbellatum		SULPHUR FLOWER	0	5	0	0	0
Heterotheca villosa	HETEROTHECA HORRIDA,CHRYSOPSIS VILLOSA	HAIRY GOLDEN ASTER	0	35	0	0	0
Liatris punctata		GAYFEATHER	0	5	0	0	0
Machaeranthera pinnatifida	HAPLOPAPPUS SPINULOSUS,MACHAERANTHERA SPINULOSA	TANSEY ASTER	0	5	0	0	0
Oligosporus dracunculus ssp. glaucus	ARTEMISIA DRACUNCULUS SSP. GLAUCUS	WILD TARRAGON	0	45	1	0	1
Physalis hederifolia var. comata		IVYLEAF GROUND-CHERRY	0	5	0	0	0
Psoralidium tenuiflorum	PSORALEA TENUIFLORA	PRAIRIE SCURFPEA	0	5	0	0	0
Ratibida columnifera		PRAIRIE CONEFLOWER	0	5	0	0	0
Rumex altissimus	RUMEX BRITTANICA	DOCK	0	15	0	0	0
Senecio spartioides		BROOM GROUNDSEL	0	15	0	0	0
Solidago speciosa var. pallida		SHOWY GOLDENROD	0	5	0	0	0
Sphaeralcea coccinea		COPPER MALLOW	0	15	0	0	0
Thelesperma megapotamicum		GREENTHREAD	0	5	0	0	0
Virgulus falcatus	ASTER FALATUS, ASTER COMMUTATUS	WHITE PRAIRIE ASTER	0	5	0	0	0
TOTAL NATIVE PERENNIAL FORBS			**2**	**85**	**4**	**2**	**4**
INTRODUCED PERENNIAL FORBS							
Breea arvensis	CIRSIUM ARVENSE	CANADA THISTLE	0	20	0	0	0
Convolvulus arvensis		FIELD BINDWEED	2	50	4	2	4
Hypericum perforatum		KLAMATH WEED	0	10	0	0	0
Linaria genistifolia ssp. dalmatica	LINARIA DALMATICA	DALMATION TOADFLAX	0	10	0	0	0
Marrubium vulgare		HOREHOUND	0	35	0	0	0
Taraxacum officinale		COMMON DANDELION	0	40	0	0	0
TOTAL INTRO. PERENNIAL FORBS			**2**	**85**	**4**	**2**	**4**
NATIVE PERENNIAL GRASSES (cool)							
Carex pensylvanica ssp. heliophila	CAREX HELIOPHILA	SUN SEDGE	0	10	0	0	0
Elymus canadensis		CANADA WILDRYE	0	10	0	0	0
Elymus elymoides	SITANION HYSTRIX	BOTTLEBRUSH SQUIRRELTAIL	1	15	1	1	1
Elymus trachycaulus	AGROPYRON TRACHYCAULUM	SLENDER WHEATGRASS	3	25	6	3	6
Elymus virginicus		VIRGINIA WILDRYE	1	15	2	1	2
Festuca spp.		NATIVE FESCUE	0	5	0	0	0
Hesperostipa comata	STIPA COMATA	NEEDLE-AND-THREAD GRASS	1	15	1	1	2
Koeleria macrantha	KOELERIA CRISTATA,K. PYRAMIDATA,K.GRACILIS	JUNEGRASS	0	5	0	0	0
Nassella viridula	STIPA VIRIDULA	GREEN NEEDLEGRASS	0	25	1	0	1
Pascopyrum smithii	AGROPYRON SMITHII	WESTERN WHEATGRASS	2	30	4	2	4
TOTAL NATIVE PERENNIAL GRASSES (c)			**7**	**45**	**16**	**8**	**16**

Table 1. All Cover Data 2018 (20 Samples)

PLANT SPECIES

Scientific Name	Synonym	Common Name	AVERAGE COVER (%)	FREQUENCY (%)	RELATIVE VEGETATION COVER (%)	AVERAGE COVER-ALL (%)	RELATIVE VEGETATION COVER-ALL (%)
INTRODUCED PERENNIAL GRASSES (cool)							
Bromopsis inermis	BROMUS INERMIS	SMOOTH BROME	1	40	1	1	1
Poa compressa		CANADA BLUEGRASS	1	5	2	1	2
Poa pratensis		KENTUCKY BLUEGRASS	6	60	12	6	12
Thinopyrum intermedium	AGROPYRON INTERMEDIUM	INTERMEDIATE WHEATGRASS	10	70	22	10	21
TOTAL INTRO. PERENNIAL GRASSES (c)			**17**	**80**	**37**	**17**	**35**
NATIVE PERENNIAL GRASSES (warm)							
Andropogon gerardii		BIG BLUESTEM - - TURKEYFOOT	1	35	1	1	1
Aristida purpurea	ARISTIDA FENDLERIANA,A. LONGISETA,A. WRIGHTII	PURPLE THREE-AWN	0	10	0	0	0
Bouteloua curtipendula		SIDEOATS GRAMA	1	45	2	1	2
Buchloe dactyloides		BUFFALOGRASS	0	10	0	0	0
Chondrosum gracile	BOUTELOUA GRACILIS	BLUE GRAMA GRASS	2	50	4	2	4
Schizachyrium scoparium	ANDROPOGON SCOPARIUM	LITTLE BLUESTEM	0	20	0	0	0
Sporobolus cryptandrus		SAND DROPSEED	0	10	0	0	0
TOTAL NATIVE PERENNIAL GRASSES (w)			**3**	**55**	**7**	**4**	**7**
NATIVE SUBSHRUBS							
Gutierrezia sarothrae		BROOM SNAKEWEED	0	10	0	0	0
TOTAL NATIVE SUBSHRUBS			**0**	**10**	**0**	**0**	**0**
NATIVE SHRUBS							
Chrysothamnus nauseosus	ERICAMERIA NAUSEOSUS VAR. NAUSEOSA	RUBBER RABBITBRUSH	0	10	1	1	1
Eriogonum effusum		WILD BUCKWHEAT	0	10	0	0	0
Oligosporus filifolius	ARTEMISIA FILIFOLIA	SAND SAGEBRUSH	0	10	0	0	0
Rosa arkansana		ARKANSAS ROSE	0	35	0	0	0
Yucca glauca		SPANISH BAYONET	0	60	0	0	0
TOTAL NATIVE SHRUBS			**1**	**60**	**2**	**1**	**2**
SUCCULENT							
Echinocereus viridiflorus		HEN-AND-CHICKENS	0	5	0	0	0
Opuntia macrorhiza	OPUNTIA COMPRESSA	TWISTPINE PRICKLYPEAR CACTUS	0	5	0	0	0
Opuntia phaeacantha		NEW MEXICO PRICKLY PEAR CACTUS	0	5	0	0	0
TOTAL SUCCULENT			**0**	**15**	**0**	**0**	**0**
LITTER		**LITTER**	**51**	**100**			
BARE SOIL		**BARE SOIL**	**3**	**70**			
ROCK		**ROCK**	**2**	**25**			
TOTALS			**100**			**103**	
TOTAL VEGETATION COVER			**46.3 (s=12.3)**		**100**	**49.1 (s=14.6)**	**100**
GROUND COVER (Litter+Rock+Veg+St.Dead)			**98**			**101**	
SPECIES DENSITY (# of species/100 sq.m.)							
(AVERAGE= 18.5 Std.Dev.= 7.7)							

Table 1. All Cover Data 2018 (20 Samples)

PLANT SPECIES

			Prairie Dog		Dense Weedy		Dense tall Intro grass			
Scientific Name	**Synonym**	**Common Name**	01-PD	02-PD	03-Dw	04-Dw	05-Dw	06-TIG	07-TIG	08-TIG
NATIVE ANNUAL & BIENNIAL FORBS										
Cirsium undulatum		WAVYLEAF THISTLE								
Dyssodia papposa		FETID MARIGOLD		P						
Erigeron divergens		SPREADING FLEABANE	P		1				P	
Grindelia squarrosa		GUMWEED	1		P				P	
Helianthus annuus		COMMON SUNFLOWER			P					
Plantago patagonica		WOOLLY PLANTAIN	P							
TOTAL NATIVE ANN. & BIEN. FORBS			**1**	**P**	**1**	**---**	**---**	**---**	**P**	**---**
INTRODUCED ANNUAL & BIENNIAL FORBS										
Acosta diffusa	CENTAUREA DIFFUSA	TUMBLE KNAPWEED				1				
Alyssum parviflorum		ALYSSUM	P							P
Bassia sieversiana	KOCHIA SCOPARIA,K. SIEVERSIANA	BURNING-BUSH	P	P			P			
Carduus nutans ssp. macrolepis		MUSK THISTLE		P	P					P
Conyza canadensis		HORSEWEED			1(1)		P		P	P
Descurainia sophia		FLIXWEED TANSYMUSTARD							P	P
Erodium cicutarium		FILAREE								
Lactuca serriola		PRICKLY LETTUCE			30(1)	1	1	1	P	2
Lappula redowskii		EARLY STICKSEED								
Melilotus officinale	MELILOTUS OFFICINALIS	YELLOW SWEETCLOVER	1	P	8(5)			P	6(1)	1
Podospermum laciniatum	SCORZONERA LACINIATIUM	FALSE SALSIFY				2				
Salsola australis	SALSOLA IBERICA,KOCHIA IBERICA,S. KALI,S. PESTIFER	RUSSIAN THISTLE	P	16	P	11	21	9(1)	1	1
Sisymbrium altissimum		JIM HILL MUSTARD	P		P					P
Solanum americanum	SOLANUM NIGRUM	BLACK NIGHTSHADE								
Solanum triflorum		NIGHTSHADE								
Tragopogon dubius ssp. major		YELLOW SALSIFY					P	P		
Verbascum blattaria		MOTH MULLEIN								P
Verbascum thapsus		MULLEIN	2(2)	5	P		P	P	P	P
Ximenesia encelioides	VERBESINA ENCELIOIDES	COWPEN DAISY	P	1						
TOTAL INTRO. ANN. & BIEN. FORBS			**3(2)**	**22**	**39(7)**	**15**	**22**	**10(1)**	**7(1)**	**4**
INTRODUCED ANNUAL GRASSES										
Anisantha tectorum	BROMUS TECTORUM	CHEATGRASS	5(3)	1	34(3)	4	1		P	
Bromus japonicus		JAPANESE BROME					P	P	5	
TOTAL INTRO. ANN. GRASSES			**5(3)**	**1**	**34(3)**	**4**	**1**	**P**	**5**	**---**

Table 1. All Cover Data 2018 (20 Samples)

PLANT SPECIES

			Prairie Dog		Dense Weedy		Dense tall Intro grass			
Scientific Name	**Synonym**	**Common Name**	01-PD	02-PD	03-Dw	04-Dw	05-Dw	06-TIG	07-TIG	08-TIG
NATIVE PERENNIAL FORBS										
Adenolinum lewisii	LINUM LEWISII	BLUE FLAX								
Ambrosia psilostachya var. coronopifolia		WESTERN RAGWEED								
Artemisia frigida		FRINGED SAGE	2	4	P	P		2	P	
Artemisia ludoviciana		PASTURE SAGE	P						1	
Asclepias speciosa		SHOWY MILKWEED								
Castilleja sessiliflora	CASTILLEJA GRANDIFLORA	LARGEFLOWERED PAINTBRUSH		P						
Comandra umbellata ssp. pallida		BASTARD TOADFLAX		P						
Drymocallis fissa	POTENTILLA FISSA	BIGFLOWER CINQUEFOIL		P						
Eriogonum umbellatum		SULPHUR FLOWER								
Heterotheca villosa	HETEROTHECA HORRIDA,CHRYSOPSIS VILLOSA	HAIRY GOLDEN ASTER	P	2					P	
Liatris punctata		GAYFEATHER								
Machaeranthera pinnatifida	HAPLOPAPPUS SPINULOSUS,MACHAERANTHERA SPINULOSA	TANSEY ASTER								
Oligosporus dracunculus ssp. glaucus	ARTEMISIA DRACUNCULUS SSP. GLAUCUS	WILD TARRAGON	1	P				P		
Physalis hederifolia var. comata		IVYLEAF GROUND-CHERRY		P						
Psoralidium tenuiflorum	PSORALEA TENUIFLORA	PRAIRIE SCURFPEA								
Ratibida columnifera		PRAIRIE CONEFLOWER								
Rumex altissimus	RUMEX BRITTANICA	DOCK								
Senecio spartioides		BROOM GROUNDSEL		P						
Solidago speciosa var. pallida		SHOWY GOLDENROD					1			
Sphaeralcea coccinea		COPPER MALLOW	2	P						
Thelesperma megapotamicum		GREENTHREAD								
Virgulus falcatus	ASTER FALATUS, ASTER COMMUTATUS	WHITE PRAIRIE ASTER								
TOTAL NATIVE PERENNIAL FORBS			**5**	**6**	**P**	**P**	**1**	**2**	**1**	**---**
INTRODUCED PERENNIAL FORBS										
Breea arvensis	CIRSIUM ARVENSE	CANADA THISTLE					P		1	
Convolvulus arvensis		FIELD BINDWEED	11	6(1)	P	P				
Hypericum perforatum		KLAMATH WEED								
Linaria genistifolia ssp. dalmatica	LINARIA DALMATICA	DALMATION TOADFLAX		P						
Marrubium vulgare		HOREHOUND	P	P						P
Taraxacum officinale		COMMON DANDELION			-1	P	P	P	P	
TOTAL INTRO. PERENNIAL FORBS			**11**	**6(1)**	**-1**	**P**	**P**	**P**	**1**	**P**
NATIVE PERENNIAL GRASSES (cool)										
Carex pensylvanica ssp. heliophila	CAREX HELIOPHILA	SUN SEDGE								
Elymus canadensis		CANADA WILDRYE							P	
Elymus elymoides	SITANION HYSTRIX	BOTTLEBRUSH SQUIRRELTAIL								
Elymus trachycaulus	AGROPYRON TRACHYCAULUM	SLENDER WHEATGRASS							3	
Elymus virginicus		VIRGINIA WILDRYE								
Festuca spp.		NATIVE FESCUE								
Hesperostipa comata	STIPA COMATA	NEEDLE-AND-THREAD GRASS		P						
Koeleria macrantha	KOELERIA CRISTATA,K. PYRAMIDATA,K.GRACILIS	JUNEGRASS								
Nassella viridula	STIPA VIRIDULA	GREEN NEEDLEGRASS							P	
Pascopyrum smithii	AGROPYRON SMITHII	WESTERN WHEATGRASS	14(2)	11(1)						
TOTAL NATIVE PERENNIAL GRASSES (c)			**14(2)**	**11(1)**	**---**	**---**	**---**	**---**	**3**	**---**

Table 1. All Cover Data 2018 (20 Samples)

PLANT SPECIES

			Prairie Dog		Dense Weedy		Dense tall Intro grass			
Scientific Name	**Synonym**	**Common Name**	01-PD	02-PD	03-Dw	04-Dw	05-Dw	06-TIG	07-TIG	08-TIG
INTRODUCED PERENNIAL GRASSES (cool)										
Bromopsis inermis	BROMUS INERMIS	SMOOTH BROME			1				P	P
Poa compressa		CANADA BLUEGRASS								
Poa pratensis		KENTUCKY BLUEGRASS				3	7(1)	6	5	10
Thinopyrum intermedium	AGROPYRON INTERMEDIUM	INTERMEDIATE WHEATGRASS			2		7	39	31	33(2)
TOTAL INTRO. PERENNIAL GRASSES (c)			---	---	**3**	**3**	**14(1)**	**45**	**36**	**43(2)**
NATIVE PERENNIAL GRASSES (warm)										
Andropogon gerardii		BIG BLUESTEM - - TURKEYFOOT	1	3						
Aristida purpurea	ARISTIDA FENDLERIANA,A. LONGISETA,A. WRIGHTII	PURPLE THREE-AWN		P						
Bouteloua curtipendula		SIDEOATS GRAMA		P					1	
Buchloe dactyloides		BUFFALOGRASS								
Chondrosum gracile	BOUTELOUA GRACILIS	BLUE GRAMA GRASS	P	P					3	
Schizachyrium scoparium	ANDROPOGON SCOPARIUM	LITTLE BLUESTEM		P						
Sporobolus cryptandrus		SAND DROPSEED				P				
TOTAL NATIVE PERENNIAL GRASSES (w)			**1**	**3**	---	**P**	---	---	**4**	---
NATIVE SUBSHRUBS										
Gutierrezia sarothrae		BROOM SNAKEWEED				P			P	
TOTAL NATIVE SUBSHRUBS			---	---	---	**P**	---	---	**P**	---
NATIVE SHRUBS										
Chrysothamnus nauseosus	ERICAMERIA NAUSEOSUS VAR. NAUSEOSA	RUBBER RABBITBRUSH								
Eriogonum effusum		WILD BUCKWHEAT	3	1						
Oligosporus filifolius	ARTEMISIA FILIFOLIA	SAND SAGEBRUSH		P						
Rosa arkansana		ARKANSAS ROSE	P	P						
Yucca glauca		SPANISH BAYONET	P	P		P	P			
TOTAL NATIVE SHRUBS			**3**	**1**	---	**P**	**P**	---	---	---
SUCCULENT										
Echinocereus viridiflorus		HEN-AND-CHICKENS		P						
Opuntia macrorhiza	OPUNTIA COMPRESSA	TWISTPINE PRICKLYPEAR CACTUS	P							
Opuntia phaeacantha		NEW MEXICO PRICKLY PEAR CACTUS								
TOTAL SUCCULENT			**P**	**P**	---	---	---	---	---	---
LITTER		**LITTER**	**51**	**49**	**23**	**73**	**60**	**42**	**42**	**53**
BARE SOIL		**BARE SOIL**	**4**	**1**	---	**5**	**2**	**1**	**1**	---
ROCK		**ROCK**	**2**	---	---	---	---	---	---	---
TOTALS			**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
TOTAL VEGETATION COVER			**43(7)**	**50(2)**	**77(11)**	**22**	**38(1)**	**57(1)**	**57(1)**	**47(2)**
GROUND COVER (Litter+Rock+Veg+St.Dead)			**96(7)**	**99(2)**	**100(11)**	**95**	**98(1)**	**99(1)**	**99(1)**	**100(2)**
SPECIES DENSITY (# of species/100 sq.m.)			**25**	**32**	**16**	**12**	**14**	**11**	**24**	**14**
(AVERAGE= 18.5 Std.Dev.= 7.7)										

Table 1. All Cover Data 2018 (20 Samples)

PLANT SPECIES

			Disturbed Native			Open shorter intro grass w/natives				
Scientific Name	**Synonym**	**Common Name**	09-DN	10-DN	11-DN	12-DN	13-SIG	14-SIG	15-SIG	16-SIG
NATIVE ANNUAL & BIENNIAL FORBS										
Cirsium undulatum		WAVYLEAF THISTLE			P					
Dyssodia papposa		FETID MARIGOLD	P							
Erigeron divergens		SPREADING FLEABANE	P							
Grindelia squarrosa		GUMWEED	1		P					
Helianthus annuus		COMMON SUNFLOWER					P			
Plantago patagonica		WOOLLY PLANTAIN			P					
TOTAL NATIVE ANN. & BIEN. FORBS			**1**	**---**	**P**	**---**	**P**	**---**	**---**	**---**
INTRODUCED ANNUAL & BIENNIAL FORBS										
Acosta diffusa	CENTAUREA DIFFUSA	TUMBLE KNAPWEED				P				
Alyssum parviflorum		ALYSSUM								
Bassia sieversiana	KOCHIA SCOPARIA,K. SIEVERSIANA	BURNING-BUSH		3		P				
Carduus nutans ssp. macrolepis		MUSK THISTLE			P			P		
Conyza canadensis		HORSEWEED	P				1	1		
Descurainia sophia		FLIXWEED TANSYMUSTARD	P	P						
Erodium cicutarium		FILAREE								
Lactuca serriola		PRICKLY LETTUCE	3	2			1	P		
Lappula redowskii		EARLY STICKSEED		P						
Melilotus officinale	MELILOTUS OFFICINALIS	YELLOW SWEETCLOVER	13(1)				P			
Podospermum laciniatum	SCORZONERA LACINIATIUM	FALSE SALSIFY								
Salsola australis	SALSOLA IBERICA,KOCHIA IBERICA,S. KALI,S. PESTIFER	RUSSIAN THISTLE		3	4	P				P
Sisymbrium altissimum		JIM HILL MUSTARD		P						
Solanum americanum	SOLANUM NIGRUM	BLACK NIGHTSHADE			P					
Solanum triflorum		NIGHTSHADE			P					
Tragopogon dubius ssp. major		YELLOW SALSIFY				P	P	P	P	P
Verbascum blattaria		MOTH MULLEIN								
Verbascum thapsus		MULLEIN	P	P	P		P	P	P	P
Ximenesia encelioides	VERBESINA ENCELIOIDES	COWPEN DAISY								
TOTAL INTRO. ANN. & BIEN. FORBS			**16(1)**	**8**	**4**	**P**	**2**	**1**	**P**	**P**
INTRODUCED ANNUAL GRASSES										
Anisantha tectorum	BROMUS TECTORUM	CHEATGRASS	P	24	19(1)	3				
Bromus japonicus		JAPANESE BROME	6				1	1		
TOTAL INTRO. ANN. GRASSES			**6**	**24**	**19(1)**	**3**	**1**	**1**	**---**	**---**

Table 1. All Cover Data 2018 (20 Samples)

PLANT SPECIES

			Disturbed Native			Open shorter intro grass w/natives				
Scientific Name	**Synonym**	**Common Name**	09-DN	10-DN	11-DN	12-DN	13-SIG	14-SIG	15-SIG	16-SIG
NATIVE PERENNIAL FORBS										
Adenolinum lewisii	LINUM LEWISII	BLUE FLAX			P					
Ambrosia psilostachya var. coronopifolia		WESTERN RAGWEED			P	P				
Artemisia frigida		FRINGED SAGE	P	1	1(3)	P	P	P		
Artemisia ludoviciana		PASTURE SAGE		P	P	P				
Asclepias speciosa		SHOWY MILKWEED								
Castilleja sessiliflora	CASTILLEJA GRANDIFLORA	LARGEFLOWERED PAINTBRUSH								
Comandra umbellata ssp. pallida		BASTARD TOADFLAX		P	P					
Drymocallis fissa	POTENTILLA FISSA	BIGFLOWER CINQUEFOIL								
Eriogonum umbellatum		SULPHUR FLOWER		P						
Heterotheca villosa	HETEROTHECA HORRIDA,CHRYSOPSIS VILLOSA	HAIRY GOLDEN ASTER	P		1	P				
Liatris punctata		GAYFEATHER			P					
Machaeranthera pinnatifida	HAPLOPAPPUS SPINULOSUS,MACHAERANTHERA SPINULOSA	TANSEY ASTER								
Oligosporus dracunculus ssp. glaucus	ARTEMISIA DRACUNCULUS SSP. GLAUCUS	WILD TARRAGON			P	4(1)	P	P		
Physalis hederifolia var. comata		IVYLEAF GROUND-CHERRY								
Psoralidium tenuiflorum	PSORALEA TENUIFLORA	PRAIRIE SCURFPEA			P					
Ratibida columnifera		PRAIRIE CONEFLOWER				P				
Rumex altissimus	RUMEX BRITTANICA	DOCK		P		P				
Senecio spartioides		BROOM GROUNDSEL			P	P				
Solidago speciosa var. pallida		SHOWY GOLDENROD								
Sphaeralcea coccinea		COPPER MALLOW								
Thelesperma megapotamicum		GREENTHREAD			P					
Virgulus falcatus	ASTER FALATUS, ASTER COMMUTATUS	WHITE PRAIRIE ASTER			P					
TOTAL NATIVE PERENNIAL FORBS			**P**	**1**	**2(3)**	**4(1)**	**P**	**P**	**---**	**---**
INTRODUCED PERENNIAL FORBS										
Breea arvensis	CIRSIUM ARVENSE	CANADA THISTLE								P
Convolvulus arvensis		FIELD BINDWEED		2	1	4				
Hypericum perforatum		KLAMATH WEED								
Linaria genistifolia ssp. dalmatica	LINARIA DALMATICA	DALMATION TOADFLAX								
Marrubium vulgare		HOREHOUND		P	P					
Taraxacum officinale		COMMON DANDELION		-1				P		
TOTAL INTRO. PERENNIAL FORBS			**---**	**2(1)**	**1**	**4**	**---**	**P**	**---**	**P**
NATIVE PERENNIAL GRASSES (cool)										
Carex pensylvanica ssp. heliophila	CAREX HELIOPHILA	SUN SEDGE			2(1)					
Elymus canadensis		CANADA WILDRYE								
Elymus elymoides	SITANION HYSTRIX	BOTTLEBRUSH SQUIRRELTAIL		3	9					
Elymus trachycaulus	AGROPYRON TRACHYCAULUM	SLENDER WHEATGRASS	11							
Elymus virginicus		VIRGINIA WILDRYE								
Festuca spp.		NATIVE FESCUE	P							
Hesperostipa comata	STIPA COMATA	NEEDLE-AND-THREAD GRASS		1	12(2)					
Koeleria macrantha	KOELERIA CRISTATA,K. PYRAMIDATA,K.GRACILIS	JUNEGRASS								
Nassella viridula	STIPA VIRIDULA	GREEN NEEDLEGRASS	1							
Pascopyrum smithii	AGROPYRON SMITHII	WESTERN WHEATGRASS	P	3						
TOTAL NATIVE PERENNIAL GRASSES (c)			**12**	**7**	**23(3)**	**---**	**---**	**---**	**---**	**---**

Table 1. All Cover Data 2018 (20 Samples)

PLANT SPECIES

			Disturbed Native			Open shorter intro grass w/natives				
Scientific Name	**Synonym**	**Common Name**	09-DN	10-DN	11-DN	12-DN	13-SIG	14-SIG	15-SIG	16-SIG
INTRODUCED PERENNIAL GRASSES (cool)										
Bromopsis inermis	BROMUS INERMIS	SMOOTH BROME				P	7	P	4	
Poa compressa		CANADA BLUEGRASS				16				
Poa pratensis		KENTUCKY BLUEGRASS	6			1	3	7(1)	14	23
Thinopyrum intermedium	AGROPYRON INTERMEDIUM	INTERMEDIATE WHEATGRASS	1	1		P	19(1)	31(1)	16	16
TOTAL INTRO. PERENNIAL GRASSES (c)			**7**	**1**	**---**	**17**	**29(1)**	**38(2)**	**34**	**39**
NATIVE PERENNIAL GRASSES (warm)										
Andropogon gerardii		BIG BLUESTEM - - TURKEYFOOT		1	3(2)	4				
Aristida purpurea	ARISTIDA FENDLERIANA,A. LONGISETA,A. WRIGHTII	PURPLE THREE-AWN			1					
Bouteloua curtipendula		SIDEOATS GRAMA	2	1	8	1				
Buchloe dactyloides		BUFFALOGRASS			-1					
Chondrosum gracile	BOUTELOUA GRACILIS	BLUE GRAMA GRASS	9	2	2(1)	P				
Schizachyrium scoparium	ANDROPOGON SCOPARIUM	LITTLE BLUESTEM								
Sporobolus cryptandrus		SAND DROPSEED				P				
TOTAL NATIVE PERENNIAL GRASSES (w)			**11**	**4**	**14(4)**	**5**	**---**	**---**	**---**	**---**
NATIVE SUBSHRUBS										
Gutierrezia sarothrae		BROOM SNAKEWEED								
TOTAL NATIVE SUBSHRUBS			**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**
NATIVE SHRUBS										
Chrysothamnus nauseosus	ERICAMERIA NAUSEOSUS VAR. NAUSEOSA	RUBBER RABBITBRUSH								
Eriogonum effusum		WILD BUCKWHEAT								
Oligosporus filifolius	ARTEMISIA FILIFOLIA	SAND SAGEBRUSH								
Rosa arkansana		ARKANSAS ROSE		P	P	2		P		
Yucca glauca		SPANISH BAYONET		3	P	P	P	P		
TOTAL NATIVE SHRUBS			**---**	**3**	**P**	**2**	**P**	**P**	**---**	**---**
SUCCULENT										
Echinocereus viridiflorus		HEN-AND-CHICKENS								
Opuntia macrorhiza	OPUNTIA COMPRESSA	TWISTPINE PRICKLYPEAR CACTUS								
Opuntia phaeacantha		NEW MEXICO PRICKLY PEAR CACTUS							-1	
TOTAL SUCCULENT			**---**	**---**	**---**	**---**	**---**	**---**	**-1**	**---**
LITTER		**LITTER**	**38**	**47**	**37**	**63**	**67**	**60**	**64**	**61**
BARE SOIL		**BARE SOIL**	**8**	**3**	**---**	**1**	**1**	**---**	**2**	**---**
ROCK		**ROCK**	**1**	**---**	**---**	**1**	**---**	**---**	**---**	**---**
TOTALS			**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
TOTAL VEGETATION COVER			**53(1)**	**50(1)**	**63(11)**	**35(1)**	**32(1)**	**40(2)**	**34(1)**	**39**
GROUND COVER (Litter+Rock+Veg+St.Dead)			**92(1)**	**97(1)**	**100(11)**	**99(1)**	**99(1)**	**100(2)**	**98(1)**	**100**
SPECIES DENSITY (# of species/100 sq.m.)			**20**	**25**	**33**	**24**	**13**	**14**	**6**	**6**
(AVERAGE= 18.5 Std.Dev.= 7.7)										

Table 1. All Cover Data 2018 (20 Samples)

PLANT SPECIES

			Mosaic tall/short w/natives			
Scientific Name	**Synonym**	**Common Name**	17-SIG	18-Mx	19-Mx	20-Mx
NATIVE ANNUAL & BIENNIAL FORBS						
Cirsium undulatum		WAVYLEAF THISTLE				
Dyssodia papposa		FETID MARIGOLD				
Erigeron divergens		SPREADING FLEABANE				
Grindelia squarrosa		GUMWEED				
Helianthus annuus		COMMON SUNFLOWER				
Plantago patagonica		WOOLLY PLANTAIN				
TOTAL NATIVE ANN. & BIEN. FORBS			---	---	---	---
INTRODUCED ANNUAL & BIENNIAL FORBS						
Acosta diffusa	CENTAUREA DIFFUSA	TUMBLE KNAPWEED				
Alyssum parviflorum		ALYSSUM				
Bassia sieversiana	KOCHIA SCOPARIA,K. SIEVERSIANA	BURNING-BUSH				
Carduus nutans ssp. macrolepis		MUSK THISTLE	P			
Conyza canadensis		HORSEWEED			P	
Descurainia sophia		FLIXWEED TANSYMUSTARD		P		
Erodium cicutarium		FILAREE				P
Lactuca serriola		PRICKLY LETTUCE	6(1)	P	P	
Lappula redowskii		EARLY STICKSEED		1		
Melilotus officinale	MELILOTUS OFFICINALIS	YELLOW SWEETCLOVER	3(1)			
Podospermum laciniatum	SCORZONERA LACINIATIUM	FALSE SALSIFY				
Salsola australis	SALSOLA IBERICA,KOCHIA IBERICA,S. KALI,S. PESTIFER	RUSSIAN THISTLE	P			
Sisymbrium altissimum		JIM HILL MUSTARD		P	1	
Solanum americanum	SOLANUM NIGRUM	BLACK NIGHTSHADE				
Solanum triflorum		NIGHTSHADE				
Tragopogon dubius ssp. major		YELLOW SALSIFY	1			
Verbascum blattaria		MOTH MULLEIN	P			
Verbascum thapsus		MULLEIN	P	P	P	
Ximenesia encelioides	VERBESINA ENCELIOIDES	COWPEN DAISY				
TOTAL INTRO. ANN. & BIEN. FORBS			**10(2)**	**1**	**1**	**P**
INTRODUCED ANNUAL GRASSES						
Anisantha tectorum	BROMUS TECTORUM	CHEATGRASS		P	11	P
Bromus japonicus		JAPANESE BROME				
TOTAL INTRO. ANN. GRASSES			---	**P**	**11**	**P**

Table 1. All Cover Data 2018 (20 Samples)

PLANT SPECIES

			Mosaic tall/short w/natives			
Scientific Name	**Synonym**	**Common Name**	17-SIG	18-Mx	19-Mx	20-Mx
NATIVE PERENNIAL FORBS						
Adenolinum lewisii	LINUM LEWISII	BLUE FLAX			P	
Ambrosia psilostachya var. coronopifolia		WESTERN RAGWEED				
Artemisia frigida		FRINGED SAGE	P	3(1)	3(4)	4
Artemisia ludoviciana		PASTURE SAGE				
Asclepias speciosa		SHOWY MILKWEED	P			
Castilleja sessiliflora	CASTILLEJA GRANDIFLORA	LARGEFLOWERED PAINTBRUSH				
Comandra umbellata ssp. pallida		BASTARD TOADFLAX				
Drymocallis fissa	POTENTILLA FISSA	BIGFLOWER CINQUEFOIL				
Eriogonum umbellatum		SULPHUR FLOWER				
Heterotheca villosa	HETEROTHECA HORRIDA,CHRYSOPSIS VILLOSA	HAIRY GOLDEN ASTER		P		
Liatris punctata		GAYFEATHER				
Machaeranthera pinnatifida	HAPLOPAPPUS SPINULOSUS,MACHAERANTHERA SPINULOSA	TANSEY ASTER		P		
Oligosporus dracunculus ssp. glaucus	ARTEMISIA DRACUNCULUS SSP. GLAUCUS	WILD TARRAGON			P	P
Physalis hederifolia var. comata		IVYLEAF GROUND-CHERRY				
Psoralidium tenuiflorum	PSORALEA TENUIFLORA	PRAIRIE SCURFPEA				
Ratibida columnifera		PRAIRIE CONEFLOWER				
Rumex altissimus	RUMEX BRITTANICA	DOCK				P
Senecio spartioides		BROOM GROUNDSEL				
Solidago speciosa var. pallida		SHOWY GOLDENROD				
Sphaeralcea coccinea		COPPER MALLOW		1		
Thelesperma megapotamicum		GREENTHREAD				
Virgulus falcatus	ASTER FALATUS, ASTER COMMUTATUS	WHITE PRAIRIE ASTER				
TOTAL NATIVE PERENNIAL FORBS			**P**	**4(1)**	**3(4)**	**4**
INTRODUCED PERENNIAL FORBS						
Breea arvensis	CIRSIUM ARVENSE	CANADA THISTLE	1			
Convolvulus arvensis		FIELD BINDWEED		1	8	5
Hypericum perforatum		KLAMATH WEED	P			P
Linaria genistifolia ssp. dalmatica	LINARIA DALMATICA	DALMATION TOADFLAX				P
Marrubium vulgare		HOREHOUND		P	P	
Taraxacum officinale		COMMON DANDELION	P			
TOTAL INTRO. PERENNIAL FORBS			**1**	**1**	**8**	**5**
NATIVE PERENNIAL GRASSES (cool)						
Carex pensylvanica ssp. heliophila	CAREX HELIOPHILA	SUN SEDGE		1		
Elymus canadensis		CANADA WILDRYE				P
Elymus elymoides	SITANION HYSTRIX	BOTTLEBRUSH SQUIRRELTAIL		P		
Elymus trachycaulus	AGROPYRON TRACHYCAULUM	SLENDER WHEATGRASS		18(1)	14(1)	13
Elymus virginicus		VIRGINIA WILDRYE		4	5	8
Festuca spp.		NATIVE FESCUE				
Hesperostipa comata	STIPA COMATA	NEEDLE-AND-THREAD GRASS				
Koeleria macrantha	KOELERIA CRISTATA,K. PYRAMIDATA,K.GRACILIS	JUNEGRASS				1
Nassella viridula	STIPA VIRIDULA	GREEN NEEDLEGRASS		1	1	4
Pascopyrum smithii	AGROPYRON SMITHII	WESTERN WHEATGRASS		8		P
TOTAL NATIVE PERENNIAL GRASSES (c)			**---**	**32(1)**	**20(1)**	**26**

Table 1. All Cover Data 2018 (20 Samples)

PLANT SPECIES

			Mosaic tall/short w/natives			
Scientific Name	**Synonym**	**Common Name**	17-SIG	18-Mx	19-Mx	20-Mx
INTRODUCED PERENNIAL GRASSES (cool)						
Bromopsis inermis	BROMUS INERMIS	SMOOTH BROME			P	
Poa compressa		CANADA BLUEGRASS				
Poa pratensis		KENTUCKY BLUEGRASS	26(2)			
Thinopyrum intermedium	AGROPYRON INTERMEDIUM	INTERMEDIATE WHEATGRASS	4			P
TOTAL INTRO. PERENNIAL GRASSES (c)			**30(2)**	**---**	**P**	**P**
NATIVE PERENNIAL GRASSES (warm)						
Andropogon gerardii		BIG BLUESTEM - - TURKEYFOOT		P		P
Aristida purpurea	ARISTIDA FENDLERIANA,A. LONGISETA,A. WRIGHTII	PURPLE THREE-AWN				
Bouteloua curtipendula		SIDEOATS GRAMA		1	1	3
Buchloe dactyloides		BUFFALOGRASS		P		
Chondrosum gracile	BOUTELOUA GRACILIS	BLUE GRAMA GRASS		3	1	14
Schizachyrium scoparium	ANDROPOGON SCOPARIUM	LITTLE BLUESTEM		P	1	P
Sporobolus cryptandrus		SAND DROPSEED				
TOTAL NATIVE PERENNIAL GRASSES (w)			**---**	**4**	**3**	**17**
NATIVE SUBSHRUBS						
Gutierrezia sarothrae		BROOM SNAKEWEED				
TOTAL NATIVE SUBSHRUBS			**---**	**---**	**---**	**---**
NATIVE SHRUBS						
Chrysothamnus nauseosus	ERICAMERIA NAUSEOSUS VAR. NAUSEOSA	RUBBER RABBITBRUSH		3	5(2)	
Eriogonum effusum		WILD BUCKWHEAT				
Oligosporus filifolius	ARTEMISIA FILIFOLIA	SAND SAGEBRUSH				P
Rosa arkansana		ARKANSAS ROSE		P		
Yucca glauca		SPANISH BAYONET		P	P	P
TOTAL NATIVE SHRUBS			**---**	**3**	**5(2)**	**P**
SUCCULENT						
Echinocereus viridiflorus		HEN-AND-CHICKENS				
Opuntia macrorhiza	OPUNTIA COMPRESSA	TWISTPINE PRICKLYPEAR CACTUS				
Opuntia phaeacantha		NEW MEXICO PRICKLY PEAR CACTUS				
TOTAL SUCCULENT			**---**	**---**	**---**	**---**
LITTER		**LITTER**	**59**	**46**	**47**	**37**
BARE SOIL		**BARE SOIL**	**---**	**7**	**2**	**9**
ROCK		**ROCK**	**---**	**2**	**---**	**2**
TOTALS			**100**	**100**	**100**	**100**
TOTAL VEGETATION COVER			**41(4)**	**45(2)**	**51(7)**	**52**
GROUND COVER (Litter+Rock+Veg+St.Dead)			**100(4)**	**93(2)**	**98(7)**	**91**
SPECIES DENSITY (# of species/100 sq.m.)			**14**	**26**	**19**	**21**
(AVERAGE= 18.5 Std.Dev.= 7.7)						

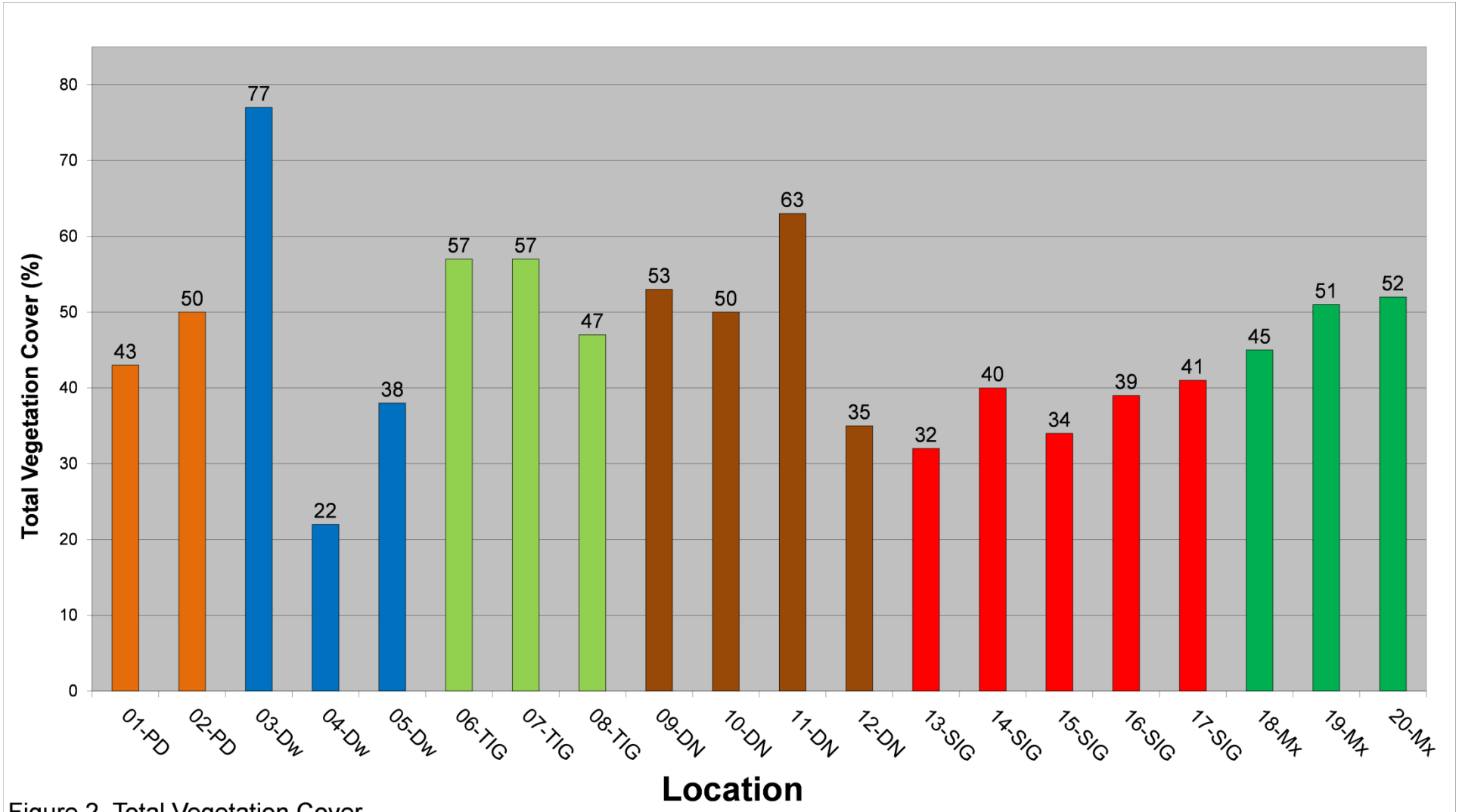


Figure 2. Total Vegetation Cover

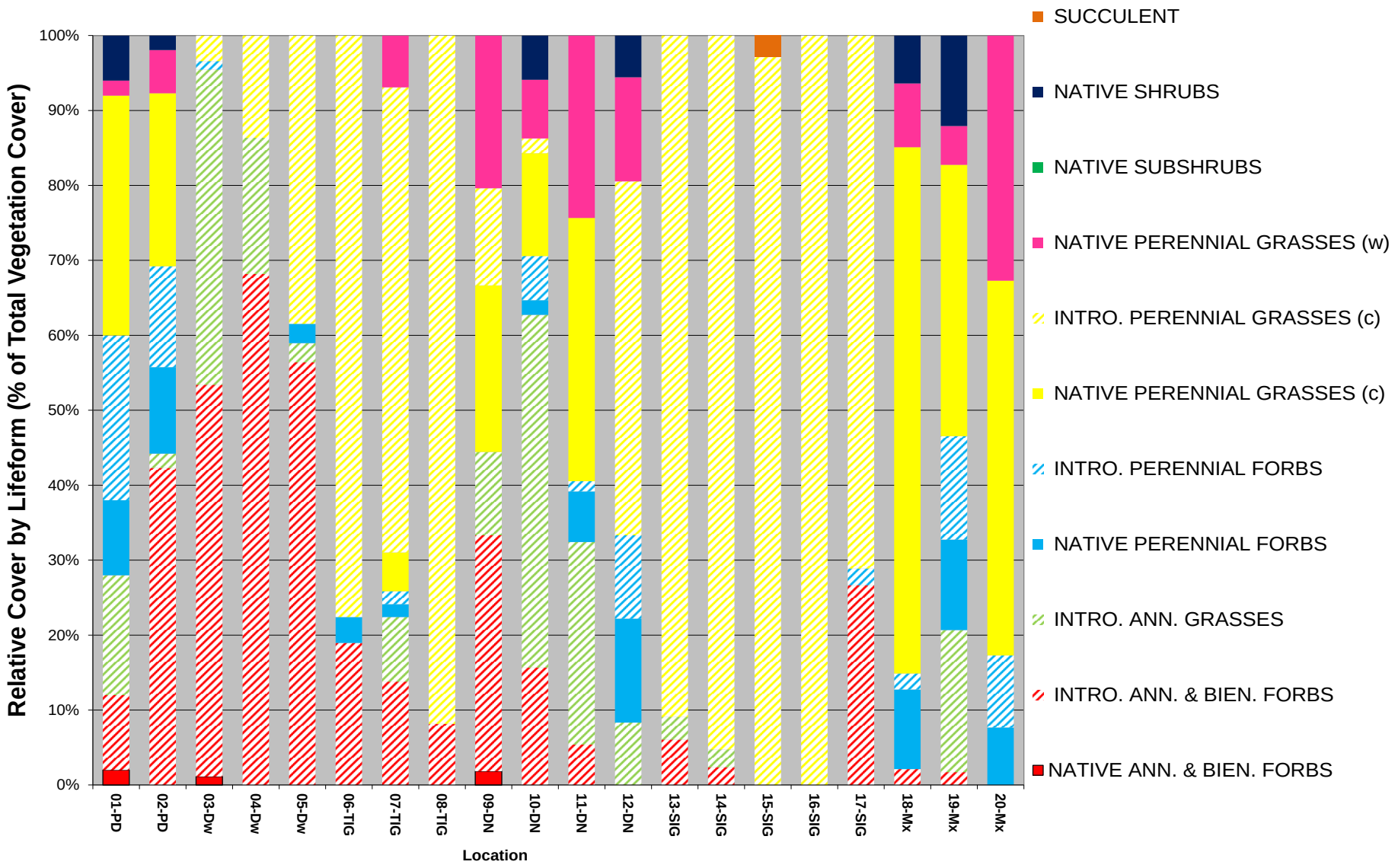


Figure 3. Relative Cover by Lifeform

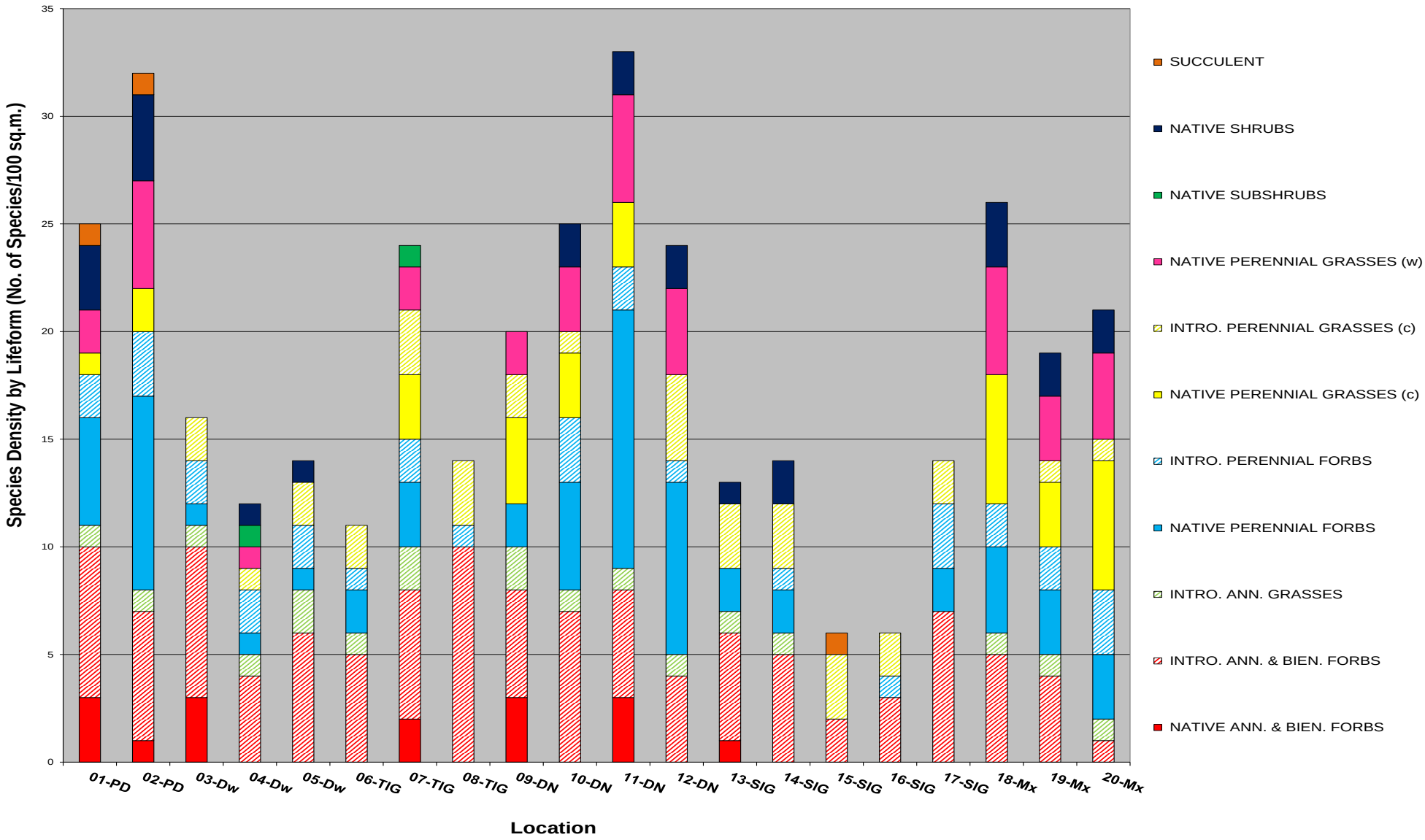


Figure 4. Species Density by Lifeform

Table 2. Louisville Site Data 2018

PROJECT	AREA	SAMPLEID	SAMPLERS	EASTING	NORTHING	ELEVATION	ORIENTATION (magnetic)	ASPECT	SLOPE (degrees)	SLOPE (pct)	COMMENT	DATE
Louisville Davidson Mesa 2018	Prairie dog	1	P.Murphy	-105 10.507	39 58.3126	5583.01	96	338	1	1.7	Some surface rock. Active pdog.	10/17/2018
Louisville Davidson Mesa 2018	Prairie dog	2	P.Murphy	-105 10.4975	39 58.2825	5593.18	18	350	1	1.7	pdog with natives on margins weedy in center	10/17/2018
Louisville Davidson Mesa 2018	Dense weedy	3	P.Murphy	-105 10.7921	39 58.1559	5621.39	230	10	1	1.7	lots of open litter. probably treated with herbicide	10/17/2018
Louisville Davidson Mesa 2018	Dense weedy	4	P.Murphy	-105 10.8878	39 58.1408	5605.64	210	320	1	1.7	dense but some open patches	10/17/2018
Louisville Davidson Mesa 2018	Dense weedy	5	P.Murphy	-105 10.858	39 58.105	5601.05	320	20	1	1.7	edge of herbicide area	10/17/2018
Louisville Davidson Mesa 2018	Tall introduced grass	6	P.Murphy	-105 10.8878	39 58.1408	5605.64	210	320	1	1.7	dense but some open patches	10/17/2018
Louisville Davidson Mesa 2018	Tall introduced grass	7	P.Murphy	-105 11.0365	39 58.0644	5612.53	116	320	2	3.5	some open patches	10/18/2018
Louisville Davidson Mesa 2018	Tall introduced grass	8	P.Murphy	-105 11.0031	39 57.9827	5625.66	192	300	1	1.7	some broine patches	10/18/2018
Louisville Davidson Mesa 2018	Disturbed native	9	P.Murphy	-105 11.0268	39 58.0063	5634.19	334	274	1	1.7	Visible planting rows with native grasses.	10/18/2018
Louisville Davidson Mesa 2018	Disturbed native	10	P.Murphy	-105 10.8118	39 58.2712	5600.72	170	350	2	3.5	some natives with weedy and open areas.	10/18/2018
Louisville Davidson Mesa 2018	Disturbed native	11	P.Murphy	-105 10.5026	39 58.2519	5592.85	350	20	1	1.7	end of transect at edge of pdog	10/19/2018
Louisville Davidson Mesa 2018	Disturbed native	12	P.Murphy	-105 10.5138	39 58.21	5601.05	110	180	20	36.4	rocky slope with andger and olidra. drain w poacom.	10/19/2018
Louisville Davidson Mesa 2018	Short intro with natives	13	P.Murphy	-105 10.733	39 58.1288	5608.92	30	60	3	5.2		10/19/2018
Louisville Davidson Mesa 2018	Short intro with natives	14	P.Murphy	-105 10.6452	39 58.2095	5605.64	300	20	1	1.7		10/19/2018
Louisville Davidson Mesa 2018	Short intro with natives	15	P.Murphy	-105 10.7331	39 58.1288	5609.58	30	60	3	5.2		10/19/2018
Louisville Davidson Mesa 2018	Short intro with natives	16	P.Murphy	-105 10.8184	39 58.0964	5618.11	224	44	1	1.7		10/19/2018
Louisville Davidson Mesa 2018	Short intro with natives	17	P.Murphy	-105 10.9398	39 58.0285	5614.5	160	10	1	1.7		10/19/2018
Louisville Davidson Mesa 2018	Tall/short dist native mosaic	18	P.Murphy	-105 10.8521	39 58.2814	5594.16	20	86	1			10/18/2018
Louisville Davidson Mesa 2018	Tall/short dist native mosaic	19	P.Murphy	-105 10.8641	39 58.2192	5594.49	354	174	1	1.7		10/18/2018
Louisville Davidson Mesa 2018	Tall/short dist native mosaic	20	P.Murphy	-105 10.9128	39 58.2108	5597.11	346	150	1	1.7		10/18/2018

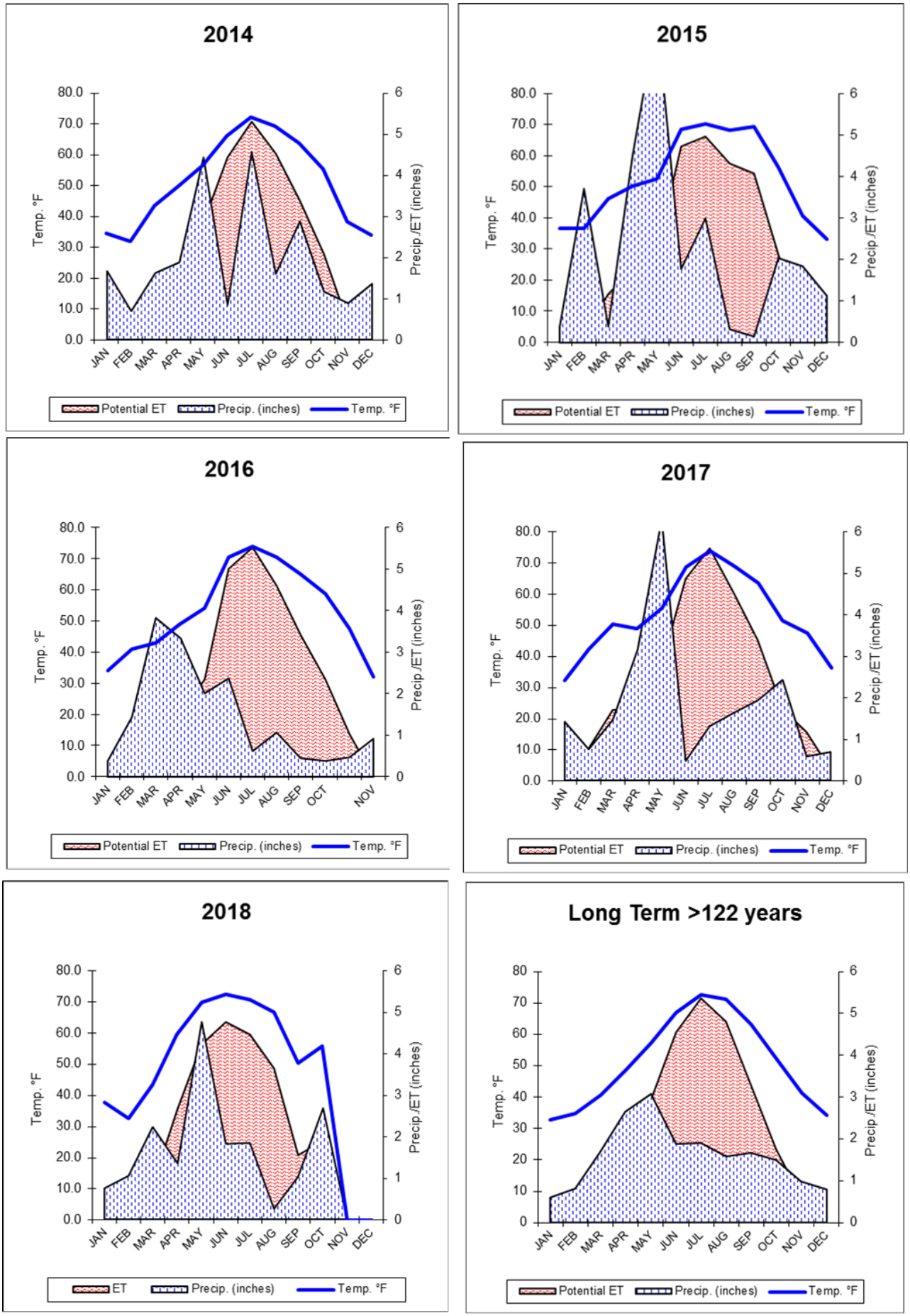


Figure 5. Thornthwaite Climate diagrams.

DISCUSSION

The following discussion will describe the characteristics of the mapped vegetation units at Davidson Mesa South including acreages.

Dense Weedy (Dw) Vegetation Unit - 6.07 acres. (03-Dw, 04-Dw, 05-Dw)
Table 3 presents a brief summary of the data for the Dense Weedy vegetation unit. Total vegetation cover ranged from 77% to 22%. This range of cover values for this weed dominated unit demonstrates that some of these areas have recently received weed control treatments. All of the areas have low bare soil, and the litter was highest at the areas with the lowest vegetation cover. The litter was predominantly dead weeds at the soil surface.

Table 3. Dense Weedy - 2018

	03-Dw	04-Dw	05-Dw
LITTER	23	73	60
BARE SOIL	---	5	2
TOTAL VEGETATION COVER	77(11)	22	38(1)
GROUND COVER (Litter+Rock+Veg+St.Dead)	100(11)	95	98(1)
SPECIES DENSITY (# of species/100 sq.m.)	16	12	14

Data in parentheses are second hits.

The following discussion references absolute cover values that include first and second hits, thus representing the total cover for that particular species

03-Dw was co-dominated by introduced annual forbs and grasses. The introduced annual forbs were *Lactuca serriola* [Prickly lettuce] (32%) and *Melilotus officinale* [Yellow sweetclover] (13%). The introduced annual grass was *Anisantha tectorum* [Cheatgrass] (37%). This transect had low species density with 16 species.

04-Dw was also co-dominated by introduced annual forbs and grasses with the lowest total vegetation cover. The dominant introduced annual forb was *Salsola australis* [Russian thistle] (11%) and the dominant introduced annual grass was *Anisantha tectorum* [Cheatgrass] (4%). This transect had the lowest species density with 12 species.

05-Dw was dominated by introduced annual forbs and introduced perennial grasses. The dominant introduced annual forb was *Salsola australis* [Russian thistle] (21%) and the dominant introduced perennial grasses were *Poa pratensis* [Kentucky bluegrass] (8%) and *Thinopyrum intermedium* [Intermediate wheatgrass] (97%). This transect had low species density with 14 species.

Disturbed Native (DN) Vegetation Unit – 35.06 acres. (09-DN, 10-DN, 11-DN, 12-DN)
Table 4 presents a brief summary of the data for the Disturbed Native vegetation unit. These areas appear to have some remnant native species as well as some planting of native species that is still visible as drill rows. Total vegetation cover ranged from 63% to 35%. These samples

showed a mix of introduced and native species. All of the areas have low bare soil, and the litter was highest at the areas with the lowest vegetation cover.

Table 4. Disturbed Native

	09-DN	10-DN	11-DN	12-DN
LITTER	38	47	37	63
BARE SOIL	8	3	---	1
ROCK	1	---	---	1
TOTAL VEGETATION COVER	53(1)	50(1)	63(11)	35(1)
GROUND COVER (Litter+Rock+Veg+St.Dead)	92(1)	97(1)	100(11)	99(1)
SPECIES DENSITY (# of species/100 sq.m.)	20	25	33	24

Data in parentheses are second hits.

The following discussion references absolute cover values that include first and second hits, thus representing the total cover for that particular species

09-DN was co-dominated by introduced forbs and grasses and native cool and warm season grasses. The dominant introduced annual forb was *Melilotus officinale* [Yellow sweet clover] (14%), and the dominant introduced annual grass was *Bromus japonicus* [Japanese brome] (6%). The dominant introduced perennial grass was *Poa pratensis* [Kentucky bluegrass] (6%). The dominant native grasses were the cool season *Elymus trachycaulus* [Slender wheatgrass] (11%) and the warm season *Chondrosum gracile* [Blue grama grass] 9%). Note that some of these native species are planted and have characteristics that make them slightly different from local natives. This transect had moderate species density with 20 species.

10-DN was dominated by introduced grass but also had a mix of native grasses, forbs and shrub. The dominant introduced annual grass was *Anisantha tectorum* [Cheatgrass] (24%). Although each of the native species was present with low cover, the combined cover was significant. Native perennial cool season grasses included *Elymus elymoides* [Bottlebrush squirreltail] (3%), and *Pascopyrum smithii* [Western wheatgrass] (3%). Native perennial warm season grasses included *Chondrosum gracile* [Blue grama grass] (2%), *Buchloe dactyloides* [Buffalograss] (1%) and *Andropogon gerardii* {Big bluestem] (1%). Also present was the native shrub *Yucca glauca* [Spanish bayonet] (3%). Note that some of these native species are planted and have characteristics that make them slightly different from local natives. This transect had moderately high species density with 25 species.

11-DN was had significant cover by introduced annual grass but also had a higher cover of native grasses and forbs. The dominant introduced annual grass was *Anisantha tectorum* [Cheatgrass] (20%). Also common was the introduced annual forb *Salsola australis* [Russian thistle] (4%). Native perennial cool season grasses included *Hesperostipa comata* [Needle-and-thread grass] (14%), *Elymus elymoides* [Bottlebrush squirreltail] (9%), and *Carex pensylvanica* ssp. *heliophila* [Sun sedge] (3%). Native perennial warm season grasses *included Bouteloua curtipendula* [Sideoats grama] (8%), *Andropogon gerardii* [Big bluestem] (5%), and *Chondrosum gracile* [Blue grama grass] (2%). Also present was the native forb *Artemisia frigida* [Fringed sage] (4%). Note that some of these native grass species are planted and have characteristics that make them slightly different from local natives. This transect had the highest species density of all samples with 33 species.

12-DN had the lowest total cover of the 4 samples but still had a mix of native and introduced species. The sample was dominated by introduced forbs and grasses but did have native grasses forbs and shrub. The dominant introduced perennial grass was *Poa compressa* [Canada bluegrass] (16%). The dominant introduced annual grass was *Anisantha tectorum* [Cheatgrass] (3%). The dominant introduced perennial forb was *Convolvulus arvensis* [Field bindweed} (4%). The dominant native perennial forb was *Oligosporus dracunculus* ssp. *glaucus* [Wild tarragon] (5%). The dominant native perennial warm season grass was *Andropogon gerardii* [Big bluestem] (4%). Also present was the native shrub *Rosa arkansana* (Arkansas rose] (2%). Note that some of these native species are planted and have characteristics that make them slightly different from local natives. This transect had moderately high species density with 24 species.

Mosaic tall/short grass (Mx) Vegetation Unit – 4.97 acres. (18-Mx, 19-Mx, 20-Mx)
Table 5 presents a brief summary of the data for the Mosaic short/tall grass vegetation unit. These areas appear to have some remnant native species as well as some planting of native species that is still visible as drill rows. Total vegetation cover ranged from 52% to 45%. These samples showed a mix of introduced and native species but with a dominance of native species. All of the areas have low bare soil, and the litter was moderate at all samples.

Table 5. Mosaic Short/Tall grass

	18-Mx	19-Mx	20-Mx
LITTER	46	47	37
BARE SOIL	7	2	9
ROCK	2	---	2
TOTAL VEGETATION COVER	45(2)	51(7)	52
GROUND COVER (Litter+Rock+Veg+St.Dead)	93(2)	98(7)	91
SPECIES DENSITY (# of species/100 sq.m.)	26	19	21

Data in parentheses are second hits.

The following discussion references absolute cover values that include first and second hits, thus representing the total cover for that particular species

18-Mx was dominated by native perennial cool season grasses. The dominant native perennial cool season grasses were *Elymus trachycaulus* [Slender wheatgrass] (19%), *Pascopyrum smithii* [Western wheatgrass] (8%), and *Elymus virginicus* [Virginia wildrye] (4%). The dominant native perennial warm season grass was *Chondrosum gracile* [Blue grama grass] (3%). Also present was the native shrub *Chrysothamnus nauseosus* [Rubber rabbitbrush] (3%). Only a few introduced species were present. This transect had moderately high species density with 26 species.

19-Mx was dominated by native perennial cool season grasses but included more introduced species than the previous sample. The dominant native perennial cool season grasses were *Elymus trachycaulus* [Slender wheatgrass] (15%) and *Elymus virginicus* [Virginia wildrye] (5%). The dominant native perennial forb was *Artemisia frigida* [Fringed sage] (7%). The dominant shrub was *Chrysothamnus nauseosus* [Rubber rabbitbrush] (7%). The dominant introduced

species was the annual grass *Anisantha tectorum* [Cheatgrass] (11%). This transect had moderate species density with 19 species.

20-Mx was dominated by native perennial cool and warm season grasses and forbs. The dominant native perennial cool season grasses were *Elymus trachycaulus* [Slender wheatgrass] (13%), *Elymus virginicus* [Virginia wildrye] (8%), and *Nassella viridula* [Green needlegrass] (4%). The dominant native perennial warm season grasses were *Chondrosum gracile* [Blue grama grass] (3%) and *Bouteloua curtipendula* [Sideoats grama] (3%). The dominant native perennial forb was *Artemisia frigida* [Fringed sage] (4%). The dominant introduced forb was *Convolvulus arvensis* [Field bindweed] (5%). This transect had moderate species density with 21 species.

Short Introduced grass (SIG) Vegetation Unit – 47.13 acres. (13-SIG, 14- SIG, 15- SIG, 16-SIG, 17- SIG)

Table 6 presents a brief summary of the data for the Short Introduced Grass vegetation unit. These areas have been planted with non-native pasture improvement grasses that now dominate. Total vegetation cover ranged from 41% to 32%. These samples were dominated by the introduced cool season grasses. All of the areas have low bare soil, and the litter was moderately high at all samples.

Table 6. Short Introduced Grass

	13-SIG	14-SIG	15-SIG	16-SIG	17-SIG
LITTER	67	60	64	61	59
BARE SOIL	1	---	2	---	---
TOTAL VEGETATION COVER	32(1)	40(2)	34(1)	39	41(4)
GROUND COVER (Litter+Rock+Veg+St.Dead)	99(1)	100(2)	98(1)	100	100(4)
SPECIES DENSITY (# of species/100 sq.m.)	13	14	6	6	14

Data in parentheses are second hits.

The following discussion references absolute cover values that include first and second hits, thus representing the total cover for that particular species

13-SIG was dominated by introduced perennial cool season grasses. The dominant native perennial cool season grasses were *Thinopyrum intermedium* [Intermediate wheatgrass] (20%), *Bromopsis inermis* [Smooth brome] (7%), and *Poa pratensis* [Kentucky bluegrass] (3%). A few introduced annual grasses and forbs were also present. This transect had low species density with 13 species.

14-SIG was dominated by introduced perennial cool season grasses. The dominant native perennial cool season grasses were *Thinopyrum intermedium* [Intermediate wheatgrass] (32%), and *Poa pratensis* [Kentucky bluegrass] (8%). A few introduced annual grasses and forbs were also present. This transect had low species density with 14 species.

15-SIG was dominated by introduced perennial cool season grasses. The dominant native perennial cool season grasses were *Thinopyrum intermedium* [Intermediate wheatgrass] (16%), *Poa pratensis* [Kentucky bluegrass] (14%), and *Bromopsis inermis* [Smooth brome] (4%). A few introduced annual grasses and forbs were also present. This transect had very low species density with 6 species.

16-SIG was dominated by introduced perennial cool season grasses. The dominant native perennial cool season grasses were *Poa pratensis* [Kentucky bluegrass] (23%) and *Thinopyrum intermedium* [Intermediate wheatgrass] (16%). A few introduced annual grasses and forbs were also present. This transect had very low species density with 6 species.

17-SIG was dominated by introduced perennial cool season grasses and introduced annual forbs. The dominant native perennial cool season grasses were *Poa pratensis* [Kentucky bluegrass] (28%) and *Thinopyrum intermedium* [Intermediate wheatgrass] (4%). Dominant introduced annual forbs included Lactuca serriola [Prickly lettuce] (7%) and Melilotus officinalis [Yellow sweetclover] (4%). A few other introduced annual grasses and forbs were also present. This transect had low species density with 14 species.

Tall Introduced grass (TIG) Vegetation Unit – 11.34 acres. (06-TIG, 07- TIG, 08- TIG)
Table 7 presents a brief summary of the data for the Tall Introduced Grass vegetation unit. These areas have been planted with non-native pasture improvement grasses that now dominate. Total vegetation cover ranged from 57% to 47%. These samples were dominated by the introduced cool season grasses. All of the areas have low bare soil, and the litter was moderate at all samples.

Table 7. Tall Introduced Grass

	06-TIG	07-TIG	08-TIG
LITTER	42	42	53
BARE SOIL	1	1	---
TOTAL VEGETATION COVER	57(1)	57(1)	47(2)
GROUND COVER (Litter+Rock+Veg+St.Dead)	99(1)	99(1)	100(2)
SPECIES DENSITY (# of species/100 sq.m.)	11	24	14

Data in parentheses are second hits.

The following discussion references absolute cover values that include first and second hits, thus representing the total cover for that particular species

06-TIG was dominated by introduced perennial cool season grasses. The dominant native perennial cool season grasses were *Thinopyrum intermedium* [Intermediate wheatgrass] (39%), and *Poa pratensis* [Kentucky bluegrass] (6%). Introduced annual forbs were dominated by *Salsola australis* [Russian thistle] (10%). Native perennial forbs included *Artemisia frigida* [Fringed sage] (2%). This transect had low species density with 11 species.

07-TIG was dominated by introduced perennial cool season grasses. The dominant native perennial cool season grasses were *Thinopyrum intermedium* [Intermediate wheatgrass] (31%), and *Poa pratensis* [Kentucky bluegrass] (5%). Introduced annual forbs were dominated by *Melilotus officinalis* [Yellow sweetclover] (7%). The introduced annual grass was *Bromus japonicus* [Japanese brome] (5%). Native perennial grass included *Elymus trachycaulus* [Slender wheatgrass] (3%) Native perennial warm season grass was also present and included *Chondrosum gracile* [Blue grama grass] (3). This transect had moderate species density with 24 species.

08-SIG was dominated by introduced perennial cool season grasses. The dominant native perennial cool season grasses were *Thinopyrum intermedium* [Intermediate wheatgrass] (35%), and *Poa pratensis* [Kentucky bluegrass] (10%). Introduced annual forbs were dominated by *Lactuca serriola* [Prickly lettuce] (2%). This transect had low species density with 14 species.

Appendix A
Photographs

Photograph 1. Plot 01-PD Origin – E-facing view. October 17, 2018.

Photograph 2. Plot 01-PD End – W-facing view.

Photograph 3. Plot 02-PD Origin – NE-facing view. October 17, 2018.

Photograph 4. Plot 02-PD End – SW-facing view.

Photograph 5. Plot 03--Dw Origin – SW-facing view. October 17, 2018.

Photograph 6. Plot 03--Dw End – NE-facing view.

Photograph 7. Plot 04-Dw Origin – SW-facing view. October 17, 2018.

Photograph 8. Plot 04-Dw End – NE-facing view.

Photograph 9. Plot 05-Dw Origin – NW-facing view. October 17, 2018.

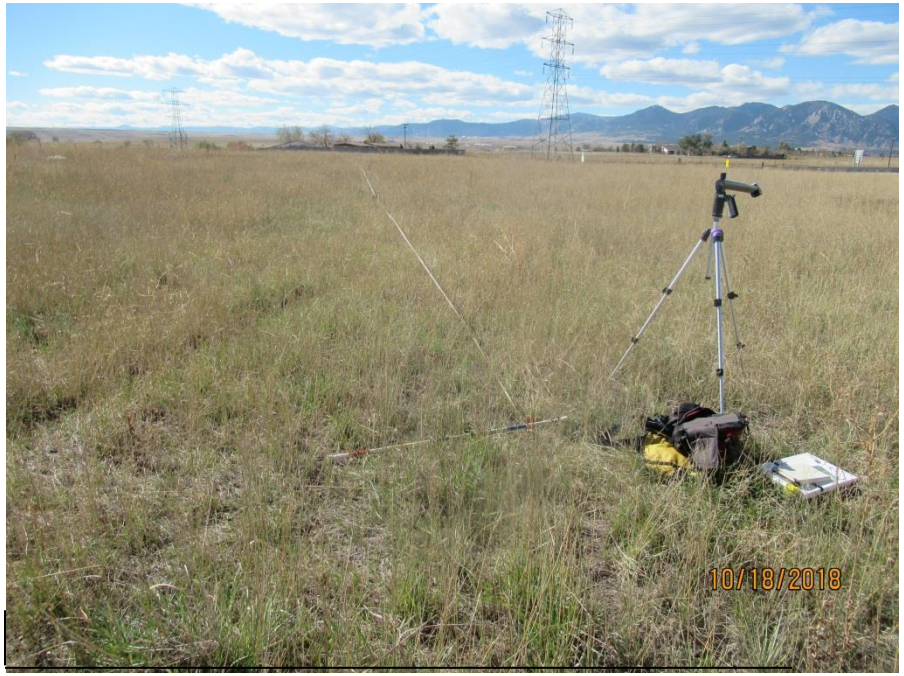
Photograph 10. Plot 05-Dw End – SE-facing view.

Photograph 11. Plot 06-TIG Origin – SW-facing view. October 17, 2018.

Photograph 12. Plot 06-TIG End – NE-facing view.

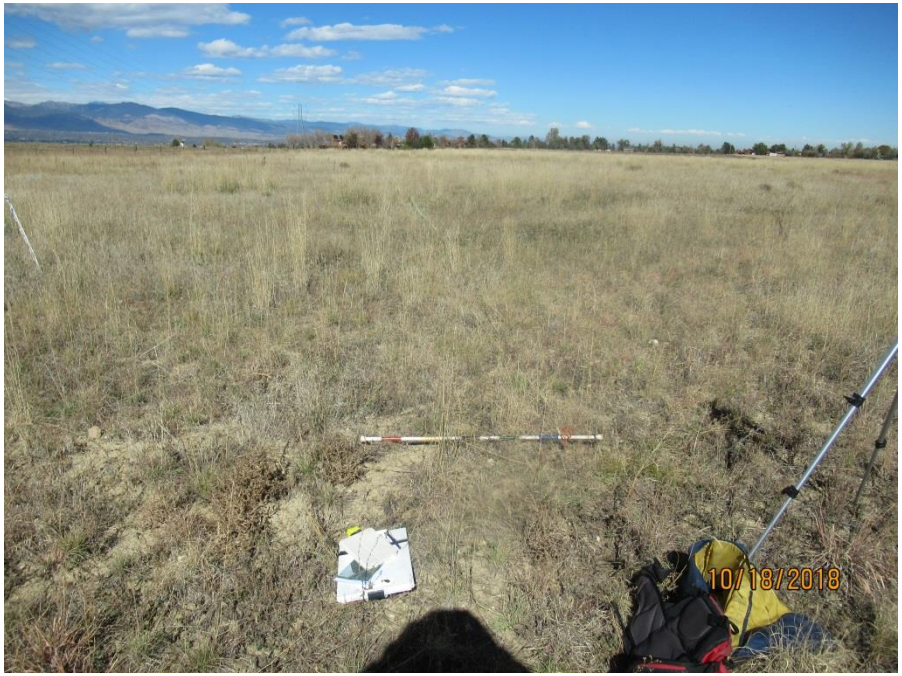
Photograph 13. Plot 07-TIG Origin – ESE-facing view. October 18, 2018.

Photograph 14. Plot 07-TIG End – WNW-facing view.



Photograph 15. Plot 08-TIG Origin – SSW-facing view. October 18, 2018.

Photograph 16. Plot 08-TIG End – NNE-facing view.



Photograph 17. Plot 09-DN Origin – NNW-facing view. October 18, 2018.

Photograph 18. Plot 09-DN End – SSE-facing view.

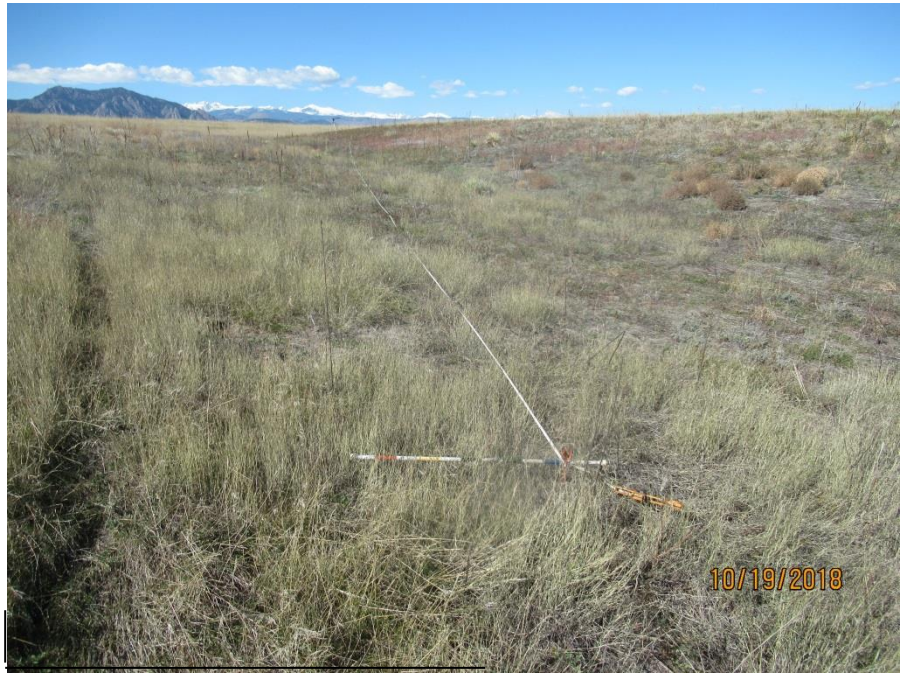
Photograph 19. Plot 10--DN Origin – S-facing view. October 18, 2018.

Photograph 20. Plot 10--DN End – N-facing view.

Photograph 21. Plot 11-DN Origin – N-facing view. October 19, 2018.

Photograph 22. Plot 11-DN End – S-facing view.

Photograph 23. Plot 12-DN Origin – ESE-facing view. October 19, 2018.



Photograph 24. Plot 12-DN End – WNW-facing view.

Photograph 25. Plot 13-SIG Origin – NW-facing view. October 19, 2018.

Photograph 26. Plot 13-SIG End – SE-facing view.

Photograph 27. Plot 14-SIG Origin – NW-facing view. October 19, 2018.

Photograph 28. Plot 14-SIG End – SE-facing view.

Photograph 29. Plot 15-SIG Origin – NE-facing view. October 19, 2018.

Photograph 30. Plot 15-SIG End – SW-facing view.

Photograph 31. Plot 16-SIG Origin – SW-facing view. October 19, 2018.

Photograph 32. Plot 16-SIG End – NE-facing view.

Photograph 33. Plot 17-SIG Origin – S-facing view. October 19, 2018.

Photograph 34. Plot 17-SIG End – N-facing view.

Photograph 35. Plot 18-Mx Origin – NNE-facing view. October 18, 2018.

Photograph 36. Plot 18-Mx End – SSW-facing view.

Photograph 37. Plot 19-Mx Origin – N-facing view. October 18, 2018.

Photograph 38. Plot 19-Mx End – S-facing view.

Photograph 39. Plot 20-Mx Origin – N-facing view. October 18, 2018.

Photograph 40. Plot 20-Mx End – S-facing view.